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# Trephining in Epilepsy.

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of Hampton, Va.

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Read before Twenty-fifth Annual Session of Medical Society of  
Virginia, held in Richmond, October 23--25, 1894.

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REPRINTED FROM TRANSACTIONS.





# Trephining in Epilepsy.

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By J. T. BOUTELLE, M. D., of Hampton, Va.

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There is scarcely any condition to be met with in surgical practice which, at first sight, seems more imperatively to demand operation, or in which the operation seems more certain to fulfill the terms of the maxim, "*Causa sublata, tollitur effectus*," than traumatic epilepsy. But as we examine the recorded results of such operations, we find little to boast of as regards certainty of cure, and the prospect of brilliant success grows decidedly dim. Cures are, of course, effected, but by no means to the extent we should naturally expect.

We have two causes to contend with—first, an abnormal condition of the skull either in shape or structure produced by injury, which, by pressure or irritation for a considerable length of time, brings about the second—viz: the tissue change or molecular disturbance of the grey matter of the brain, and this is the immediate cause of the epilepsy. This condition of the grey matter may spread over an area of uncertain size or be confined to a small spot. When the molecular change in the brain-tissue has reached a certain degree, epilepsy begins, and goes on gradually increasing in violence. Then the question naturally arises—Do we expect to cure the disease by removing the primary cause?

Up to within a few years, the operation consisted of removing the depressed portion of the bone or of simply taking out a button over the site of injury. This was formerly a serious affair, but antiseptic surgery has rendered it as safe as almost any other operation.



Modern methods of surgery and the immense advance of neurological science in localizing the motor centres of the brain have emboldened surgeons to go much further than formerly. The new, or modern, operation consists of trephining over a very large area, opening the dura, examining the surface of the brain, removing cysts or growths, and in excising a portion of brain substance from the centre indicated by the special symptoms in each case. One of the chief features of this operation is that it is performed for non-traumatic cases.

By the old operation, a fair amount of success has been obtained, either cure or marked amelioration in a respectable number of cases—certainly enough to justify the operation. If we believed many of the statistics collected to be beyond criticism, we should speak much more enthusiastically. I shall not attempt, in this paper, to give complete statistics, but will call attention to a few.

Walsham's collection gives, out of 82 cases, 48 cured and 13 relieved.

Dr. W. Briggs reports, out of 30 cases, 25 cured and 3 relieved. Such results as these would justify almost any serious operation.

In 1872, I reported a collection of cases performed at the Massachusetts General Hospital up to that time—12 cases, 4 cured, 1 relieved, 7 deaths. *Boston Med. and Surg. Jour.*, Feb. 22, 1872.

In the *American Journal of Medical Sciences*, November, 1892, Drs. Gerster and Sachs report 10 cases. No cures—1 great improvement, and 1 slight improvement. These last are unusually frank statistics.

In most of the individual cases I have looked up, which are classed as successful, the record generally reads, "No fits two to eight months after operation when last heard from," and we never hear any more about that case. Very few records show observation of the case after six or eight months.

If a country surgeon does this operation, and it is not successful, he will never be allowed to forget it. I believe that a successful record, to be of any value to the surgeon, must be that of a case which has been under observation from two to three years.

The following two cases from my own practice will serve to illustrate a few points of interest:

CASE I.—February, 1893. Edw. Johnson, white, æt. 18, when five years old, received a blow on the head from an axe which fell from a shed and cut through the skull. No doctor was called, and he had only home treatment. The wound healed, and he never had any symptoms until he was sixteen years old. Then, while sparring with another boy, he received a heavy blow upon the head, and shortly after began to have light epileptic attacks, which gradually increased in frequency and violence until now they occur once to three times a week and are quite severe. His parents say that they think his mind is becoming impaired.

I found a linear depression, running longitudinally over left parietal bone about middle of anterior third, about two inches long. My diagnosis was an original fracture of both tables without depression of inner table—that the blow eleven years later loosened some fragment and caused it to change its position and produce pressure on the brain. He was taken to the Dixie Hospital for treatment. The day before operation his head was shaved, scrubbed with soap and water, then with alcohol and turpentine, and a compress wet with a solution of mercuric bichloride 1-3000 kept on the scalp.

Operation February 14, 1893. Scalp-flap raised by horse-shoe incision. Button removed at each end of the depression, and the intervening piece sawed out. For this purpose, I used a small circular saw attached to a dental engine, and with this one side was sawed through, but in commencing the section of the other side the engine got out of order, and the section was made with a Hey's saw. Before completing the second section, I passed a flat probe under the skull, and felt a piece of bone projecting downward, close to the line of section. This was broken off with a small curved dental instrument and drawn out. The section was then completed. The dura had not been punctured by the fragment, and was apparently healthy. The edges of the opening were then smoothed off, and the opening thoroughly irrigated with bichlorid. sol. 1-3000. The flap was then adjusted and united by aseptic silk sutures. No drainage was used. The wound healed by first intention, and the patient never had a temperature above 99.5°. No pus was seen. No medical treatment was used until a week after operation, when an epileptic attack occurred. He was then put on bromide treatment.

He made a good recovery and went home. I saw him now and then for several months, and continued the bromide treatment. He had no fits for about six months. Since then I hear that he went away on a vessel, and while on a cruise the fits recurred, and now are as bad as ever. When I saw him last the wound was perfectly healed, but a deep depression was caused by the sagging of the scalp into the opening.



CASE II.—April, 1893. Frank W., white, æt. 40. Received a blow on the head when six years old, causing depression of bone. Ten years after, began to have epileptic attacks, petit mal, and these gradually increased in severity and frequency, sometimes being very mild, but often severe convulsive attacks. He tells me that before the attacks of petit mal he had peculiar sensations and mental disturbance, for which, at one time, a physician was consulted. I found a well-marked, rounded depression in right parietal bone about the middle of posterior third. He went to the Dixie Hospital, and his head was prepared as in the case just reported. A button of bone, large enough to include the depression, was removed. The dura looked healthy, but was slightly adherent around the opening. It was easily separated by light pressure with a small flat scapula. No projecting bone was found. The button showed some thickening, but no scar of fracture of internal table. The wound was closed as in the first case. No drainage. Union took place by first intention. No pus. No temperature above normal at any time.

About a week after the operation, he was much excited by a death at the hospital and the loud lamentations of the relatives, and had an attack of acute mania, being restrained with difficulty. Was then taken home, where he slept steadily for twenty-four hours or more, and then recovered his senses. For about two months, there was apparently great improvement, and either none or very slight attacks of petit mal, but after that time the attacks recurred and now are as bad as ever.

These cases illustrate the old operation under antiseptic methods, and are sufficiently typical to emphasize some points. In the first place, the healing by first intention, no pus, and no fever. In the twelve cases I reported occurring before 1871 were seven deaths; the causes of death being suppuration, meningitis, or sloughing of membranes. It would be rare now to find such a proportion of deaths, or from such causes.

It will be noticed that in these cases benefit was derived from the operation at first—in one case no fits for about six months, and in the other great amelioration for two or three months, but then the disease recurs and gradually resumes its old course. This, I fear, would be the history of many a case reported cured, if it could be followed up, and I think it is a result for which there are many good reasons. It does not require an injury severe enough to cause pressure upon the brain by spiculæ of bone to produce traumatic epilepsy. Case II shows only a

slight thickening of the bone and very slight adhesion of the dura. A case was recently reported in the *Boston Medical and Surgical Journal* where a button was removed, no adhesion of dura found, and only a slight hyperplasia of the bone. A scar of scalp wound occasionally produces the disease, and cases are reported where removal of the cicatrix had brought about a cure. Any injury which brings about a change in the skull tissue may cause molecular change in the brain beneath. Slight adhesion of the dura to the skull is a sufficient cause. Also a tumor in the white matter, near the cortex, will produce epileptic symptoms.

Now, when we remove a piece of the skull, we leave behind a condition likely of itself to produce adhesion of the dura to the margins of the opening, or the scalp sinks into the opening and either adheres to the dura or irritates it, and after a certain lapse of time we again have a condition which reproduces the disease. Then the details of the operation should be such as to prevent these sequelæ. In the old operation, I see no way of doing this except by carefully bevelling and smoothing the lower edge and closing the upper end of the opening with some hard substance.

In these cases, we notice that one had a fit one week after the operation, and then was put upon bromide treatment, after which he was well for a long time. The other had an attack of mania, and then was put on medical treatment, and amelioration resulted. It is certain that operation alone will not cure. Medical treatment should be instituted in every case as soon as possible after the operation, and continued just as in an idiopathic case.

The modern operation consists, as I have stated, of removing not only the depression or a button at the site of the injury, but of trephining over an area large enough to allow of a complete examination of the brain surface. The dura is opened, cysts or growths removed, and the motor area to be attacked determined by faradization. Then a portion of grey matter, and sometimes some of the white matter, is excised.

Nothing can be more thoroughly scientific than this operation, and it seems to fulfill every surgical requirement in remov-



ing both the primary and secondary causes. From such a radical measure, we should naturally look for the most brilliant results. It ought to produce certain and lasting cures, at least in the majority of cases.

But it is a very severe operation, and attended with considerable risk. It generally demands two agents—one an expert in nervous disease to locate the exact part to be removed, and the other a more than ordinarily expert surgeon. If the operation is successful, it is a brilliant affair, and one to reflect credit on all concerned in its accomplishment. But if unsuccessful, the patient has undergone a serious risk to life, and still has his epilepsy, plus a very large hole in his skull, and a more or less permanent paralysis of some part. Motor paralysis of the part governed by the centre excised, of course, is a result. It is stated by some of the most prominent operators in cerebral surgery that this paralysis is only temporary, and that the part will eventually recover its functions. The patient is also left with the same conditions I have mentioned, when speaking of the old operation, as possible factors in the recurrence of the disease at a later period.

Then, in order to justify such radical proceedings, we must have unusually good results.

Statistics of this operation are not, as yet, abundant, and I do not pretend to give anything like a complete collection; but I have examined the cases recorded in the *American Journal of Medical Sciences* for the past six years, and have tabulated an epitome of the cases I have found reported, fourteen in number. Two of these were caused by tumor of the brain, and eight were non-traumatic cases.

The study of cerebral surgery, as exemplified by many skillful operations in removal of tumors, is of great interest in connection with the subject under discussion. I have only collected the cases in which epilepsy was a prominent symptom.



No.	CASE.	Reporters.	Journal.	RESULTS.
1	Right-sided Jacksonian Epilepsy with facio-brachial paralysis. Tumor of left hemisphere involving centres for face and right arm. Trephined and tumor removed. Bone disks replaced, and united firmly.	Drs. Weir and Seguin.	<i>Amer. Jour. of Medical Sciences</i> , July, 1888.	Recovery. Temporary complete paralysis of right limb, and aphasia. Eventually regained speech, and the paralysis improved. Seven months after operation was having occasional slight spasms. Much relieved.
2	Epilepsy of uncertain origin. Attacks commence in right hand. Trephined over fissure of Rolando, dura raised and centre for left hand and wrist excised.	Dr. W. W. Keen.	<i>Ibid.</i> , November, 1888.	Recovered from operation in eight days. Left arm paralyzed, but showing signs of improvement. Two months after, the epileptic attacks were diminished in frequency and were only petit mal. Much relieved.
3	Focal epilepsy of severe character. Attacks commence in left arm. Trephined over fissure of Rolando, right side. Three pieces of brain excised, each $\frac{3}{4}$ of an in. deep and $\frac{1}{2}$ in. wide at centres for left arm, hand and face.	Drs. Lloyd and Deaver.	<i>Id.</i> , Novemb'r, 1888.	Recovered from operation with motor paralysis of arm. Record three months after shows no convulsive attacks, and motion returning in arm to some extent. Much relieved (or cured).
	Here four cases of cerebral surgery are reported, of which three are of interest as regard epilepsy.	Drs. Jacob Frank and Archibald Church.	<i>Id.</i> , July, 1890.	
4	Dementia of alleged traumatic origin. Trephined, dura raised, and brain surface explored. Buttons replaced and united. 2nd operation. Adhesions of dura were found, very firm with processes running into trephine pin openings. Small pieces of bone were partly absorbed and acted as foreign bodies; the dura showed marks of the buttons and the interstices between the buttons showed fibrous scar tissue. The cicatricial tissue was dissected off, and the bone was not replaced.	Drs. Frank and Church.	<i>Ibid.</i> , July, 1890.	Great improvement at first, but in 9 months epilepsy developed. After 2nd operation, patient recovered, and in one month was reported as having no fits, and improved in all respects. Much relieved.

No.	CASE.	Reporters.	Journal.	RESULTS.
5	Jacksonian epilepsy. Trephined and tumor of brain removed. Five buttons replaced. 2nd operation. The buttons were found tilted and making pressure on the brain. Abscess of brain found, evacuated, irrigated and drained. Buttons were not replaced. One was left which had united properly.		Ibid., July, 1890.	Improved for a time, and then epilepsy recurred. After 2nd operation, recovered. One year after, record shows condition much better than before operation, but convulsions occur about once in ten days. Much relieved.
6	Idiocy and continuous choroid movements. Trephined over motor zones. Three buttons removed and replaced.		"	Died on the third day. Autopsy showed that the buttons were firmly adherent to the dura.
7	Traumatic epilepsy. Trephined, and a portion of cortex removed. The opening was closed by a piece of decalcified bone, stitched to the scalp so as to fit the opening.	Dr. W. W. Keen.	<i>Am. Jour. of Medical Sciences</i> , Septemb'r, 1891.	Recovery. No attacks at time of record, eight months after operation. The opening is closed with firm tissue. Cured.
8	Jacksonian epilepsy. Trephined over motor zone. Small growths excised from the dura and a portion of cortex removed. Bone not replaced. In this case, the fits occurred twelve to fifteen times in twenty-four hours.	Drs. Mills and Keen.	<i>Am. Jour. of Medical Sciences</i> , December, 1891.	Left limb paralyzed, but eventually recovered. Convulsions continued from time to time, but less severe and less frequent. Seven months after, record shows an average of three fits in 24 hours. Much relieved.
9	Cortical epilepsy. Fits severe at times, and at others mild. Trephined over centre for right arm. Dura opened. No cortical substance excised. Brain punctured by trocar on account of bulging. No tumor or fluid found. Brain surface washed.	Dr. Alex. B. Shaw.	Ibid., January, 1893.	Recovered. Seven months after operation, record shows entire absence of fits. Complete paralysis of right arm. Cured.
10	Traumatic epilepsy. Trephined over large area. Mass of thickened dura removed.	Drs. White and Wood.	Ibid., Novemb'r, 1892.	Recovered, and was well for six months. Then the disease returned, and intellect failed.
	Of the 10 cases reported by Drs. Gerster and Sachs, 4 may be classed with the modern operation.	Drs. Gerster and Sachs.	Ibid., Novemb'r, 1892.	No improvement.

No.	CASE.	Reporters.	Journal.	RESULTS.
11	Right-sided epilepsy after injury. Trephined over motor area for right arm. Dura punctured. No cysts.			Recovered. No attacks for about 1½ months. Diminution of attacks. Case not heard from later. Relieved.
12	Traumatic Jacksonian epilepsy, involving muscles of right side of mouth. Trephined over centre for angle of mouth. Adhesions found under the buttons. Small cysts on dura punctured.	Drs. Gers-ter and Sachs.	<i>Am. Jour. of Medical Sciences</i> , Novemb'r, 1872.	No improvement.
13	Injury of right side of occiput. One year later, right hand and leg convulsed. Averages three to four fits in two weeks. Trephined and motor centre on left side exposed. No cortical tissue removed. 2nd operation 31 days later, and arm centre removed.	"	"	No improvement.
14	Non-traumatic Jacksonian epilepsy, beginning in left hand. Trephined and centre for left hand removed.	"	"	Some immediate improvement, but no lasting benefit.

These records then give us three cured, six relieved, four not improved, one death.

If we take the bald result of these statistics, we must say that the modern operation makes no better showing than the old. Three cases out of the fourteen I have set down as cured, as they are just as good cures as are generally reported—*i. e.*, one case having no fits up to eight months after operation; one none for three months; and one none for seven months, but with complete paralysis of right arm. We find marked amelioration in five cases and slight in one. We cannot say that the excellence of results is commensurate with the brilliancy of the performance, or that such statistics justify so severe and difficult an operation. But in every operation of this kind each case must be taken by itself, and on examination we find that these fourteen cases were exceptionally bad and difficult to handle. The



non-traumatic cases reflect much credit on the diagnosticians and operators. Future study and progress may enable the profession to give better results.

Among the details of the operation, the most important to my mind, is the closing of the external opening. For this purpose many means have been tried with varying success, replacing the buttons and filling in the interstices with bone dust, using plates of metal, gold, silver, etc., celluloid plates, highly spoken of by some operators, and decalcified bone. Making a sort of trap-door by sawing three sides and partially sawing the other, raising the piece and afterward bringing it down again, is a method for which much is claimed. Replacing the buttons seems to me attended with as much risk of future trouble as leaving the hole open. The buttons may tilt and cause pressure; they may partially absorb and act as foreign bodies, or may necrose and have to be removed by a subsequent operation. In the above table we find a case where the operation was done for idiocy or some cerebral trouble, the buttons replaced, and after a length of time epilepsy came on. The buttons were found partially absorbed, some tilted and generally causing cerebral disturbance. In another case in which death occurred after three days, the buttons were found adherent to the dura, which I think would have eventually caused epilepsy had the patient lived.

The most successful case in every respect among the above is one of Dr. W. W. Keen's, in which he closed the opening by a piece of decalcified bone, and this is a method which I think ought to be followed up and given further trial.

As to instrumental methods of removing the bone, surgeons differ, some preferring the large trephine and rongeur, others the mallet and chisel, and others the circular saw. I only propose to speak of one, of which I have had personal experience, viz., the circular saw and dental engine. The only fault I have to find with it is that it is too good. It cuts bone with such ease and rapidity that it requires a light hand and much dexterity, and as we approach the inner surface we feel much anxiety lest it may cut through into the brain. The guard, which can be attached to the saw, cannot be regulated so as to

be right for the varying thickness of the bone to be cut. After I had succeeded in making one section with this instrument, I was much relieved when the engine broke down and I could take a Hey's saw in my hand and go ahead with confidence. In spite of the remark I find in Wyeth's Surgery that Hey's saw is a useless thing and should be discarded from among surgical instruments, I must say that I used it with great satisfaction in this case.

In connection with this subject the question always arises of early trephining in injuries of the skull, and when trephining should be done. In view of the fact that the operation itself may be a factor of future trouble, does it seem best to trephine immediately for every injury which may possibly cause epilepsy in the future? To my mind, certainly not. To trephine when there is no depression, or a simple fracture of one or both tables, unless symptoms are present demanding such interference, seems to me uncalled for and just as likely to produce epilepsy as the original injury. But after a certain lapse of time from the receipt of injury certain symptoms may develop, perhaps petit mal, or even before such indication, some mental disturbance or peculiar sensations which cause a consultation with the physician. This is the time. The moment any cerebral disturbance shows itself, after injury to the skull, is the golden moment for operation. The longer we wait gives the disease a better hold and it will increase in violence, and the longer it has lasted, the less the hope of cure.

The modern operation seems to be the only surgical means of effecting a cure or amelioration in the non-traumatic cases of focal epilepsy.

In traumatic epilepsy, I should say the old operation was the best, and advise operating at the very earliest symptoms of cerebral trouble, bevelling and smoothing the lower edges of the opening and closing the outer opening by the best method possible, and commencing medical treatment immediately after the operation. But if we find clear indications for opening the dura, the records of recent cerebral operations show that this proceeding is not attended with the grave dangers to life that we formerly feared.







